

## General Characteristics

- An industrial method of preparation of methanol is
  - catalytic reduction of carbon monoxide in presence of  $\text{ZnO-Cr}_2\text{O}_3$ .
  - by reacting methane with steam at  $900^\circ\text{C}$  with a nickel catalyst
  - by reducing formaldehyde with lithium aluminium hydride
  - by reacting formaldehyde with aqueous sodium hydroxide solution
- Wood alcohol is
 

(a) $\text{CH}_3\text{OH}$	(b) $\text{C}_2\text{H}_5\text{OH}$	(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	(d) $(\text{CH}_3)_2\text{CHOH}$
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- Grain alcohol is
 

(a) $\text{CH}_3\text{OH}$	(b) $\text{C}_2\text{H}_5\text{OH}$	(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	(d) $(\text{CH}_3)_2\text{CHOH}$
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- Rubbing alcohol is
 

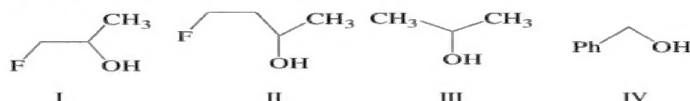
(a) $\text{CH}_3\text{OH}$	(b) $\text{C}_2\text{H}_5\text{OH}$	(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	(d) $(\text{CH}_3)_2\text{CHOH}$
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- Absolute alcohol is
 

(a) $\text{CH}_3\text{OH}$	(b) $\text{C}_2\text{H}_5\text{OH}$	(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	(d) $(\text{CH}_3)_2\text{CHOH}$
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- The increasing order of boiling point of the given alcohols is
  - 1-pentanol > 3-methyl-2-butanol > 2-methyl-2-butanol
  - 1-pentanol > 2-methyl-2-butanol > 3-methyl-2-butanol
  - 3-methyl-2-butanol > 2-methyl-2-butanol > 1-pentanol
  - 2-methyl-2-butanol > 3-methyl-2-butanol > 1-pentanol
- Which of the following sequences regarding the acidic nature of alcohols is correct?
  - $\text{CH}_3\text{OH} > 1^\circ > 2^\circ > 3^\circ$
  - $\text{CH}_3\text{OH} < 1^\circ < 2^\circ < 3^\circ$
  - $1^\circ > \text{CH}_3\text{OH} > 2^\circ < 3^\circ$
  - $1^\circ < \text{CH}_3\text{OH} < 2^\circ < 3^\circ$
- The correct sequence regarding the Brønsted basicity of alcohols is
  - $1^\circ > 2^\circ > 3^\circ$
  - $1^\circ < 2^\circ < 3^\circ$
  - $1^\circ < 2^\circ > 3^\circ$
  - $1^\circ > 2^\circ < 3^\circ$
- A  $2^\circ$  ROH can undergo
  - via  $\text{S}_{\text{N}}1$  nucleophilic substitution only
  - via  $\text{S}_{\text{N}}2$  nucleophilic substitution only
  - both  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$  nucleophilic substitution
  - neither  $\text{S}_{\text{N}}1$  nor  $\text{S}_{\text{N}}2$  nucleophilic substitution
- Hydrogen bonding is maximum in
  - ethanol
  - diethylether
  - ethyl chloride
  - triethylamine
- Which of the following alcohols is expected to have minimum boiling point?
  - 1-Butanol
  - 2-Butanol
  - 2-Methyl-2-propanol
  - 1-Pentanol
- The relative order of acidity of alcohols in comparison to  $\text{H}_2\text{O}$  and  $\text{HC}\equiv\text{CH}$  is
  - $\text{H}_2\text{O} > \text{ROH} > \text{HC}\equiv\text{CH}$
  - $\text{H}_2\text{O} > \text{HC}\equiv\text{CH} > \text{ROH}$
  - $\text{ROH} > \text{H}_2\text{O} > \text{HC}\equiv\text{CH}$
  - $\text{ROH} > \text{HCOOH} > \text{H}_2\text{O}$
- The relative order of basicity of conjugate bases is
  - $\text{OH}^- < \text{OR}^- < \text{HC}\equiv\text{C}^-$
  - $\text{OH}^- < \text{HC}\equiv\text{C}^- < \text{OR}^-$
  - $\text{HC}\equiv\text{C}^- < \text{OH}^- < \text{OR}^-$
  - $\text{HC}\equiv\text{C}^- < \text{OR}^- < \text{OH}^-$
- Glycerine is a/an
  - secondary alcohol
  - tertiary alcohol
  - ester
  - trihydric alcohol
- Among the following compounds, the strongest acid is
  - $\text{HC}\equiv\text{CH}$
  - $\text{C}_6\text{H}_6$
  - $\text{C}_2\text{H}_6$
  - $\text{CH}_3\text{OH}$
- The compound that will react most readily with  $\text{NaOH}$  to form methanol is
  - $(\text{CH}_3)_4\text{N}^+\text{I}^-$
  - $\text{CH}_3\text{OCH}_3$
  - $(\text{CH}_3)_3\text{S}^+\text{I}^-$
  - $(\text{CH}_3)_3\text{CCl}$

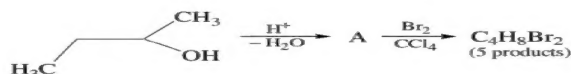
## Cleavage of R-OH Bond

- The compound which reacts fastest with Lucas reagent at room temperature is
  - 1-butanol
  - 2-butanol
  - 2-methylpropanol
  - 2-methylpropan-2-ol
- HBr reacts fastest with
  - 2-methylpropan-2-ol
  - propan-1-ol
  - propan-2-ol
  - 2-methylpropan-1-ol
- The compound which gives the most stable carbonium ion on dehydration is
  - $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}_2\text{OH}$
  - $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{OH}$
  - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
  - $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_2\text{CH}_3$
- Butanonitrile may be prepared by heating
  - propyl alcohol with  $\text{KCN}$
  - butyl alcohol with  $\text{KCN}$
  - propyl chloride with  $\text{KCN}$
  - butyl chloride with  $\text{KCN}$
- The order of reactivity of  $\text{HX}$  towards  $\text{ROH}$  is
  - $\text{HI} > \text{HBr} > \text{HCl}$
  - $\text{HI} < \text{HBr} < \text{HCl}$
  - $\text{HI} > \text{HBr} < \text{HCl}$
  - $\text{HI} < \text{HBr} > \text{HCl}$
- The order of reactivity of alcohols towards hydrogen halide is
  - benzyl >  $3^\circ > 2^\circ > 1^\circ$
  - benzyl <  $3^\circ < 2^\circ < 1^\circ$
  - $3^\circ > 2^\circ > 1^\circ > \text{benzyl}$
  - $3^\circ > 2^\circ > \text{benzyl} > 1^\circ$

- The dehydration of 1-butanol gives
  - 1-butene as the main product
  - 2-butene as the main product
  - equal amounts of 1-butene and 2-butene
  - 2-methylpropene
- The order of reactivity of the following alcohols



- towards concentrated  $\text{HCl}$  is
- $\text{I} > \text{II} > \text{III} > \text{IV}$
  - $\text{I} > \text{III} > \text{II} > \text{IV}$
  - $\text{IV} > \text{III} > \text{II} > \text{I}$
  - $\text{IV} > \text{III} > \text{I} > \text{II}$
- 3, 3-Dimethyl-2-butanol, on reacting with concentrated  $\text{HCl}$ , gives
    - 3,3-dimethyl-2-chlorobutane
    - 2,3-dimethyl-2-chlorobutane
    - a mixture of 3,3-dimethyl-2-chlorobutane and 2,3-dimethyl-2-chlorobutane.
    - 3,3-dimethyl-1-chlorobutane
  - The reaction of neopentyl alcohol with concentrated  $\text{HCl}$  gives
    - neopentyl chloride
    - 2-chloro-2-methylbutane
    - 2-methyl-2-butene
    - a mixture of neopentyl chloride and 2-methyl-2-butene.
  - The reaction of neopentyl alcohol with  $\text{SOCl}_2$  gives
    - neopentyl chloride
    - 2-chloro-2-methylbutane
    - 2-methyl-2-butene
    - a mixture of neopentyl chloride and 2-methyl-2-butene
  - The reaction of 3-buten-2-ol with aqueous  $\text{HBr}$  gives
    - 3-bromo-1-butene only
    - 1-bromo-2-butene only
    - a mixture of 3-bromo-1-butene and 1-bromo-2-butene
    - 4-bromo-1-butene.
  - The major product in the reaction of  $\text{PhCH}_2\text{CH}(\text{OH})\text{CH}(\text{CH}_3)_2$  with concentrated  $\text{H}_2\text{SO}_4$  is
    - $\text{Ph}-\text{C}(\text{H})=\text{C}(\text{CH}_3)_2$
    - $\text{Ph}-\text{C}(\text{H})=\text{C}(\text{H})\text{CH}_2\text{CH}_3$
    - $\text{PhCH}_2-\text{C}(\text{H})=\text{C}(\text{CH}_3)_2$
    - $\text{Ph}-\text{C}(\text{CH}_3)=\text{C}(\text{CH}_3)_2$
  - HBr reacts fastest with
    - $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
    - $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$
    - $p\text{-CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{OH}$
    - $p\text{-ClC}_6\text{H}_4\text{CH}_2\text{OH}$
  - HBr reacts slowest with
    - $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
    - $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$
    - $p\text{-CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{OH}$
    - $p\text{-ClC}_6\text{H}_4\text{CH}_2\text{OH}$
  - In the reaction



**Characteristic of Alcohols**

49. In the Victor-Meyer test, blue colouration is shown by  
(A) 1° alcohol (B) 2° alcohol (C) 3° alcohol (D) diol
50. Reaction of tertiary butyl alcohol with hot Cu at 350 °C produces  
(A) butanol (B) butanal (C) 2-butene (D) 2-methylpropene
51. Lucas reagent is  
(A) anhydrous  $\text{AlCl}_3$  with concentrated HCl (B) anhydrous  $\text{ZnCl}_2$  and concentrated  $\text{H}_2\text{SO}_4$   
(C) anhydrous  $\text{ZnCl}_2$  and concentrated HCl (D) anhydrous  $\text{CaCl}_2$  and concentrated HCl
52. The compound that does not react with Lucas reagent is  
(A) *n*-butanol (B) *sec*-butyl alcohol (C) isobutyl alcohol (D) *tert*-butyl alcohol
53. In the Victor-Meyer test, red colouration is shown by  
(A) 1° alcohol (B) 2° alcohol (C) 3° alcohol (D) phenol
54. In the Lucas test of alcohols, appearance of cloudiness is due to the formation of  
(A) aldehydes (B) ketones (C) acid chlorides (D) alkyl chlorides
55. Which of the alcohols does not give iodoform test?  
(a)  $(\text{CH}_3)_2\text{CH}(\text{OH})\text{CH}_3$  (b)  $\text{PhCH}(\text{OH})\text{CH}_2\text{CH}_3$   
(c) 1-methylcyclohexanol (d)  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
56. 1-propanol and 2-propanol can be best distinguished by  
(a) oxidation with alkaline  $\text{KMnO}_4$  followed by reaction with Fehling solution.  
(b) oxidation with acidic dichromate followed by reaction with Fehling solution.  
(c) oxidation by heating with copper followed by reaction with Fehling solution.  
(d) oxidation with concentrated  $\text{H}_2\text{SO}_4$  followed by reaction with Fehling solution. (2001)

**Ethers**

57. Which of the following is expected to have the lowest boiling point?  
(a)  $\text{CH}_3\text{CH}_2\text{OH}$  (b)  $\text{CH}_3\text{CHO}$  (c)  $\text{CH}_3\text{COOH}$  (d)  $\text{CH}_3\text{OCH}_3$
58. Which of the following does not react with sodium metal?  
(a)  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  (b)  $\text{CH}_3\text{OH}$  (c)  $\text{CH}_3\text{COOH}$  (d)  $\text{HCOOH}$
59. The heating of phenyl methyl ether with HI produces  
(a) ethyl chloride (b) iodobenzene (c) phenol (d) benzene
60. The IUPAC name of  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_3$  is  
(a) diethyl ether (b) ethyl propyl ether (c) ethoxypropane (d) propoxyethane
61. The reaction  $\text{CH}_3\text{I} + \text{C}_2\text{H}_5\text{ONa} \rightarrow \text{CH}_3\text{OC}_2\text{H}_5 + \text{NaI}$  is an example of  
(a) Wurtz synthesis (b) Clemenson reaction (c) Williamson synthesis (d) Dow reaction
62. Which of the following compounds does not fit into the phenomenon of metamerism?  
(a)  $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$  (b)  $\text{CH}_3\text{OCH}(\text{CH}_3)_2$  (c)  $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$  (d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
63. The alkoxy group in benzene is  
(a) *ortho* directing (b) *para* directing  
(c) *ortho* and *para* directing (d) *meta* directing
64. The formation of peroxide linkage in ether due to the exposure in air can be detected by treating it with  
(a) sodium (b) dilute hydrochloric acid  
(c) aqueous ferrous ammonium sulphate followed by addition of ammonium thiocyanate  
(d) dilute sodium hydroxide
65. The exposure of ether in air for a long time may cause  
(a) oxidation to carboxylic acid (b) the formation of peroxide linkage  
(c) oxidation to produce aldehyde or ketone (d) the degradation of the molecule
66. Ethers  
(a) are soluble in concentrated acids  
(b) are insoluble in concentrated acids  
(c) have unpleasant smell  
(d) have higher boiling point in comparison to the alcohol of comparable molecular mass

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67. Given are the two cleavage reactions:  
(i)  $(\text{CH}_3)_3\text{COCH}_3 \rightarrow \text{CH}_3\text{I} + (\text{CH}_3)_3\text{COH}$   
(ii)  $(\text{CH}_3)_3\text{COCH}_3 \rightarrow \text{CH}_3\text{OH} + (\text{CH}_3)_3\text{COH}$   
Which of the following statements is correct?  
(a) The reagent used in reaction (i) is anhydrous HI in ether and in reaction (ii) is concentrated HI  
(b) The reagent used in reaction (i) is concentrated HI and in reaction (ii) is anhydrous HI in ether  
(c) The reagent used both in reactions (i) and (ii) is concentrated HI  
(d) The reagent used both in reactions (i) and (ii) is anhydrous HI in ether
68. The word epoxide represents  
(a) cyclic ether (b) noncyclic ether (c) unsaturated ether (d) branched ether
69. The word oxiranes represents  
(a) cyclic ether (b) noncyclic ether (c) unsaturated ether (d) branched ether
70. The correct order of bond angles  $\text{H}-\text{O}-\text{H}$ ,  $\text{CH}_3-\text{O}-\text{H}$  and  $\text{CH}_3-\text{O}-\text{CH}_3$  is  
(a)  $\text{H}-\text{O}-\text{H} < \text{CH}_3-\text{O}-\text{H} < \text{CH}_3-\text{O}-\text{CH}_3$  (b)  $\text{H}-\text{O}-\text{H} < \text{CH}_3-\text{O}-\text{CH}_3 < \text{CH}_3-\text{O}-\text{H}$   
(c)  $\text{CH}_3-\text{O}-\text{H} < \text{H}-\text{O}-\text{H} < \text{CH}_3-\text{O}-\text{CH}_3$  (d)  $\text{CH}_3-\text{O}-\text{H} < \text{CH}_3-\text{O}-\text{CH}_3 < \text{H}-\text{O}-\text{H}$
71. Starting materials for Williamson synthesis of an ether are  
(a)  $\text{RONa} + \text{R}'\text{OH}$  (b)  $\text{RONa} + \text{R}'\text{X}$  (c)  $\text{ROH} + \text{R}'\text{OH}$  (d)  $\text{ROH} + \text{R}'\text{X}$
72. The ether  $(\text{CH}_3)_3\text{COCH}_3$  is cleaved with (i) anhydrous HI, and (ii) concentrated HI. The products obtained, respectively, are  
(a)  $\text{CH}_3\text{I} + (\text{CH}_3)_3\text{COH}$ ;  $\text{CH}_3\text{I} + (\text{CH}_3)_3\text{COH}$  (b)  $\text{CH}_3\text{I} + (\text{CH}_3)_3\text{COH}$ ;  $\text{CH}_3\text{OH} + (\text{CH}_3)_3\text{COH}$   
(c)  $\text{CH}_3\text{OH} + (\text{CH}_3)_3\text{COH}$ ;  $\text{CH}_3\text{I} + (\text{CH}_3)_3\text{COH}$  (d)  $\text{CH}_3\text{OH} + (\text{CH}_3)_3\text{COH}$ ;  $\text{CH}_3\text{OH} + (\text{CH}_3)_3\text{COH}$
73. Acid-catalysed reaction of propene oxide with MeOH gives  
(a)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OMe}$  (b)  $\text{CH}_3\text{CH}(\text{OMe})\text{CH}_2\text{OH}$   
(c)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$  (d)  $\text{CH}_3\text{CH}(\text{OMe})\text{CH}_2(\text{OMe})$
74. The reaction of  $(\text{CH}_3)_2\text{C}=\text{CH}_2$  with  $\text{CH}_3\text{OH}$  in (i) acid  $\text{H}^+$ , and (ii) base  $\text{CH}_3\text{O}^-$ , respectively, give  
(a)  $(\text{CH}_3)_2\text{C}(\text{OCH}_3)\text{CH}_2\text{OH}$  and  $(\text{CH}_3)_2\text{CH}(\text{OH})\text{CH}_2\text{OCH}_3$   
(b)  $(\text{CH}_3)_2\text{C}(\text{OCH}_3)\text{CH}_2\text{OH}$  and  $(\text{CH}_3)_2\text{C}(\text{OCH}_3)\text{CH}_2\text{OH}$   
(c)  $(\text{CH}_3)_2\text{C}(\text{OCH}_3)\text{CH}_2\text{OCH}_3$  and  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{OH}$   
(d)  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{OH}$  and  $(\text{CH}_3)_2\text{C}(\text{OCH}_3)\text{CH}_2\text{OCH}_3$
75. Diethyl ether on heating with concentrated HI gives two moles of  
(a) ethanol (b) ethyl iodide (c) iodoform (d) methyl iodide (1982)

**Multiple Correct Choice Type**

1. Which of the following alcohols react with Lucas reagent at room temperature?  
(a)  $\text{CH}_3\text{CH}_2\text{OH}$  (b)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$  (c)  $(\text{CH}_3)_3\text{COH}$  (d)  $\text{CH}_3\text{OH}$
2. Which of the following statements are **not** correct?  
(a) The branched isomer of an alcohol has lower boiling point than the unbranched alcohol.  
(b) Ethylene glycol boils at a temperature lower than that of ethanol.  
(c) The hydroboration-oxidation process gives product corresponding to Markovnikov addition of water to the carbon-carbon double bond.  
(d) The oxymercuration-demercuration process gives products corresponding to anti-Markovnikov addition of water to the carbon-carbon double bond.
3. Which of the following statements are correct?  
(a) The addition of water to the carbon-carbon double bond via hydroboration-oxidation process does not involve any rearrangement of carbon skeleton.  
(b) The rearrangement of carbon skeleton may occur during the conversion of alcohol into alkene.  
(c) The rearrangement of carbon skeleton may occur during the conversion of alcohol into alkyl halide.  
(d) The cleavage of carbon-oxygen bond in alcohols is catalyzed in the presence of an acid.
4. Which of the following statements are correct?  
(a) The substitution of hydroxyl group by a halogen group in alcohol is an electrophilic substitution reaction.

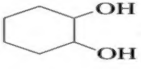
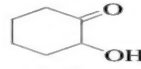
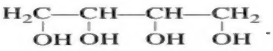
- (b) Alcohols are weak acids as well as weak bases.  
 (c) A secondary alcohol on oxidation gives a carboxylic acid containing the same number of carbon atoms.  
 (d) A primary alcohol on oxidation gives a carboxylic acid containing the same number of carbon atoms.
5. Which of the following statements are **not** correct?  
 (a) Tertiary butyl alcohol gives positive iodoform test.  

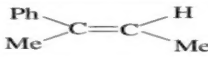
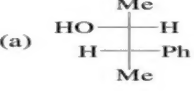
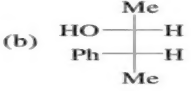
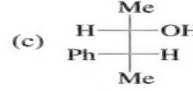
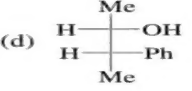
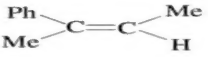
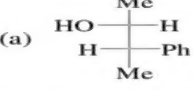
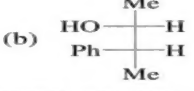
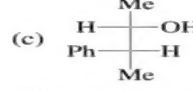
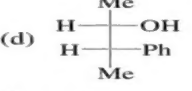
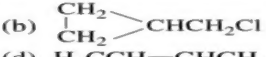
$$\begin{array}{c} \text{H} \\ | \\ \text{CH}_3\text{CH}_2-\text{C}-\text{CH}_2\text{CH}_3 \\ | \\ \text{OH} \end{array}$$
  
 (b) gives positive iodoform test.  
 (c) The carbon-carbon bond in  $\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{R}-\text{C}-\text{C}-\text{R}' \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$  can be broken by the use of periodic acid and the product obtained are two aldehydes.  
 (d) The carbon-carbon bond in  $\begin{array}{c} \text{R}' \quad \text{H} \\ | \quad | \\ \text{R}-\text{C}-\text{C}-\text{R}' \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$  can be broken by the use of periodic acid giving two aldehydes.
6. Which of the following statements are correct?  
 (a) The molecule  $\begin{array}{c} \text{RCHCH}_2\text{CHR}' \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$  is cleaved by  $\text{HIO}_4$  giving  $\text{RCHO}$  and  $\text{R}'\text{CHO}$ .  
 (b) Tertiary alcohols are more readily dehydrated than the secondary alcohols.  
 (c) Tertiary butyl alcohol when passed over hot metallic Cu at 570 K produces isobutene.  
 (d) Primary alcohols show positive Lucas test.
7. Which of the following statements are **not** correct?  
 (a) Tertiary alcohols show positive Lucas test with slower speed than in the case of secondary alcohols.  
 (b) The order of increasing acidity amongst  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols is  
 $1^\circ \text{ alcohol} < 2^\circ \text{ alcohol} < 3^\circ \text{ alcohol}$   
 (c) The reaction of glycerol with small amount of HI produces 2-iodopropane.  
 (d) The reaction of glycerol with excess of HI produces 1,2,3-triiodopropane.
8. Which of the following statements are correct?  
 (a)  $\beta$ -Chloroethyl alcohol is a stronger acid than ethyl alcohol.  
 (b) Benzyl alcohol is a stronger acid than *p*-nitrobenzyl alcohol.  
 (c) The amount of  $\text{HIO}_4$  consumed when it is treated with one mol of  $\begin{array}{c} \text{CH}_2\text{CHCH}_2\text{OCH}_3 \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$  is 2 mol.  
 (d) The amount of  $\text{HIO}_4$  consumed when it is treated with one mole of  $\text{CH}_2\text{OH}(\text{CHOH})_3\text{CHO}$  is 4 mol.
9. Which of the following statements are correct?  
 (a) An organic compound on treating with  $\text{HIO}_4$  gives  $\text{CH}_3\text{COCH}_3$  and  $\text{HCHO}$ . The compound is  

$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}_2 \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$$
  
 (b) An organic compound on treating with  $\text{HIO}_4$  gives  $5\text{HCOOH}$  and one  $\text{HCHO}$ . The compound is  

$$\begin{array}{c} \text{H}_2\text{C}(\text{CHOH})_4\text{CH}_2 \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$$
  
 (c) Thiols are less soluble in water as compared to the corresponding alcohols.
10. Which of the following statements are **not** correct?  
 (a) Absolute alcohol can be obtained by distillation of ethanol and water mixture.  
 (b) Cyclohexanol is more soluble in water than 1-hexanol.
- (c) The hydration of 3-phenyl-1-butene in dilute  $\text{H}_2\text{SO}_4$  produces 3-phenyl-2-butanol.  
 (d) The hydration of cyclobutylethene in dilute  $\text{H}_2\text{SO}_4$  gives 1-cyclobutylethanol.
11. Which of the following statements are correct?  
 (a) Alcohol is slightly more acidic than water.  
 (b) The reaction of  $\text{HBr}$  with *n*-butanol follows  $\text{S}_{\text{N}}1$  mechanism.  
 (c) The reaction of  $\text{HBr}$  with *t*-butyl alcohol follows  $\text{S}_{\text{N}}1$  mechanism.  
 (d) (*R*)-2-Hexanol on reacting with concentrated  $\text{HBr}$  gives (*S*)-2-bromohexane.
12. Which of the following statements are correct?  
 (a) (*R*)-3-Methyl-3-hexanol on reacting with concentrated  $\text{HBr}$  gives excess of *S*-3-bromo-3-methylhexane.  
 (b)  $\text{S}_{\text{N}}1$  nucleophilic substitution in  $\text{ROH}$  may lead to the rearrangement of carbon skeleton.  
 (c)  $\text{S}_{\text{N}}2$  nucleophilic substitution in  $\text{ROH}$  not only brings inversion of geometry but also the rearrangement of carbon skeleton.  
 (d) 3-Pentanol reacts with  $\text{HBr}$  to give a mixture of 3- and 2-bromopentane. The reaction follows  $\text{S}_{\text{N}}1$  nucleophilic substitution mechanism.
13. Which of the following statements are correct?  
 (a) The product of the reaction  $\text{Ph}_2\text{CHCH}_2\text{OH}$  with  $\text{HBr}$  gives  $\text{PhCHBrCH}_2\text{Ph}$ .  
 (b) The reaction of  $1^\circ$  or  $2^\circ$   $\text{ROH}$  with  $\text{PBr}_3$  proceeds with the inversion giving  $\text{BrR}$ .  
 (c) The correct decreasing order of dehydration of the given alcohols with  $\text{H}_2\text{SO}_4$  is  
 $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}(\text{CH}_3)_2 > \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}(\text{CH}_3)_2 > \text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{OH}$   
 (d) The rate of dehydration of  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}(\text{CH}_3)_2$  with  $\text{H}_2\text{SO}_4$  is faster than that of  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$ .
14. Which of the following statements are correct?  
 (a) The rate of dehydration of  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$  with  $\text{H}_2\text{SO}_4$  is faster than  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}(\text{CH}_3)_2$ .  
 (b) The dehydration of cyclobutylmethanol gives cyclobutylethene.  
 (c) The decreasing order of reactivity of benzyl alcohol with  $\text{HBr}$  is  
 $p\text{-CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{OH} > \text{C}_6\text{H}_5\text{CH}_2\text{OH} > p\text{-ClC}_6\text{H}_4\text{CH}_2\text{OH} > p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$   
 (d)  $\text{MnO}_2$  is a milder oxidising agent than  $\text{KMnO}_4$ .
15. Which of the following statements are correct?  
 (a)  $\text{MnO}_2$  can be used for selective oxidation of OH group of allylic and benzylic  $1^\circ$  and  $2^\circ$  alcohols to give aldehydes and ketones, respectively.  
 (b) The oxidation of  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{OH}$  with  $\text{MnO}_2$  gives  $\text{CH}_3\text{CHO}$  and  $\text{OHCCHO}$ .  
 (c) The oxidation of  $\text{PhCH}_2\text{OH}$  with  $\text{MnO}_2$  gives  $\text{PhCHO}$ .  
 (d) The oxidation of  $\text{PhCH}(\text{OH})\text{CH}_2\text{CH}_2\text{OH}$  with  $\text{MnO}_2$  gives  $\text{PhCCH}_2\text{CHO}$ .  

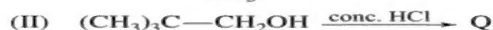
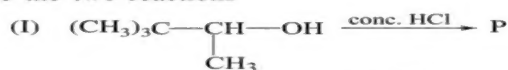
$$\begin{array}{c} \text{O} \\ || \\ \text{PhCCH}_2\text{CHO} \end{array}$$
16. Which of the following statements are **not** correct?  
 (a) The reduction of  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{COOH}$  with  $\text{LiAlH}_4$  gives  $p\text{-O}_2\text{NC}_6\text{H}_5\text{CH}_2\text{CH}_2\text{OH}$ .  
 (b) The reaction of  $\text{Ph}_2\text{C}=\text{CHCH}_3$  with  $\text{BH}_3$  in tetrahydrofuran followed by  $\text{H}_2\text{O}_2/\text{OH}^-$  gives  $\text{Ph}_2\text{C}(\text{OH})\text{CH}_2\text{CH}_3$ .  
 (c) Cyclopentylmethylcarbinol does not give iodoform test.  
 (d) An alcohol containing  $-\text{CH}(\text{OH})\text{CH}_3$  gives iodoform test.
17. Which of the following statements are correct?  
 (a)  $\text{ROH}$  is a stronger acid than  $\text{RSH}$ .  
 (b) The IUPAC name of  $\text{CH}_3\text{S}^-\text{Na}^+$  is sodium methylmercaptide or sodium methanthiolate.  
 (c)  $\text{ROH}$  is a stronger base than  $\text{RSH}$ .  
 (d) The reaction  $\text{RSH} + \text{OH}^- \rightleftharpoons \text{RS}^- + \text{HOH}$  lies far towards the left side.
18. Which of the following statements are **not** correct?  
 (a) The reaction  $\text{ROH} + \text{OH}^- \rightleftharpoons \text{RO}^- + \text{HOH}$  lies far towards the left side.  
 (b) The reaction  $\text{ROH} + \text{R}'\text{S}^-\text{Na}^+ \longrightarrow \text{RO}^- \text{Na}^+ + \text{R}'\text{SH}$  is feasible.

- (c)  $\text{RS}^-$ , in a protic solvent, acts as a stronger nucleophile than  $\text{RO}^-$ .  
 (d) The bond angle  $\text{R}-\text{O}-\text{H}$  in methanol is smaller than that of  $\text{R}-\text{S}-\text{H}$  in methanethiol.
19. Which of the following statements are **not** correct?  
 (a) Ethanol vapour is passed over heated copper and the product is treated with aqueous sodium hydroxide. The final product is  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CHO}$ .  
 (b) Aliphatic ethers are purified by shaking with a ferrous salt to remove peroxide which are formed on prolonged standing in contact with air.  
 (c) The catalyst octacarbonyldicobalt reduces the aldehyde  $\text{RCHO}$  to  $2^\circ$  alcohol.  
 (d) The treatment of  $\text{CH}_3\text{CHO}$  to  $\text{RMgX}$  followed by hydrolysis gives  $1^\circ$  alcohol.
20. Which of the following statements are **not** correct?  
 (a) The treatment of  $\text{CH}_3\text{COCH}_3$  to  $\text{RMgX}$  followed by hydrolysis gives  $2^\circ$  alcohol.  
 (b) Alkenes react with mercuric acetate in the presence of water to give hydroxymercurial compounds which on reduction yield alcohols.  
 (c) Alkenes undergo hydroboration with diborane to yield alkyl boranes which on oxidation give alcohols.  
 (d) Hydroboration-oxidation of 1-butene gives isobutyl alcohol.
21. Which of the following statements are correct?  
 (a) Hydroboration-oxidation of 2-methyl-2-butene gives 3-methyl-2-butanol.  
 (b) The reaction of ethylene oxide with  $\text{RMgX}$  followed by hydrolysis gives  $\text{RCH}_2\text{CH}_2\text{OH}$ .  
 (c) The reaction  $\text{HC}\equiv\text{C}^- \text{Na}^+ + \text{ROH} \rightarrow \text{RO}^- \text{Na}^+ + \text{HC}\equiv\text{CH}$  lies more to the right. From this, it follows that  $\text{ROH}$  is stronger acid than acetylene and  $\text{RO}^- \text{Na}^+$  is a weaker base than  $\text{HC}\equiv\text{C}^- \text{Na}^+$ .  
 (d) The oxidation of an alcohol involves the loss of one or more hydrogen from the carbon bearing the  $-\text{OH}$  group.
22. Which of the following statements are **not** correct?  
 (a) The conversion of a primary alcohol to the aldehydic stage can be conveniently carried out by using the reagent alkaline  $\text{KMnO}_4$ .  
 (b) An alcohol giving positive iodoform test must contain the group  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})-\text{CH}_2-$ .  
 (c) In the iodoform test performed by an alcohol, the first step is the oxidation of alcohol into ketone by sodium hypoiodite.  
 (d) The treatment of glycol with periodic acid gives  $\text{HCHO}$ .
23. Which of the following statements are **not** correct?  
 (a) The oxidation of  $\text{R}-\text{CH}(\text{OH})-\text{CH}(\text{OH})-\text{CH}(\text{OH})-\text{R}'$  with  $\text{HIO}_4$  gives the products  $\text{RCHO} + \text{HCHO} + \text{R}'\text{CHO}$  and the amount of  $\text{HIO}_4$  consumed is two mol.  
 (b) The treatment of  $\text{HIO}_4$  to 1,2-dihydrocyclohexane produces  $\text{OCH}(\text{CH}_2)_4\text{CHO}$ .  
 (c) The primary alcohols produce blue colour in the Victor-Meyer method.  
 (d) The secondary alcohols produce red colour in the Victor-Meyer method.
24. Which of the following statements are correct?  
 (a) The tertiary alcohols produce no colour in the Victor-Meyer method.  
 (b) An organic compound on treating with  $\text{HIO}_4$  gives  $\text{OHC}(\text{CH}_2)_4\text{CHO}$ . The compound is .  
 (c) An organic compound on treating with  $\text{HIO}_4$  gives  $\text{HOOC}(\text{CH}_2)_4\text{CHO}$ . The compound is .  
 (d) An organic compound on treating with  $\text{HIO}_4$  gives  $2\text{HCOOH} + 2\text{HCHO}$ . The compound is .

25. The products of hydroboration-oxidation of  produces
- (a)  (b)  (c)  (d) 
26. The products of hydroboration-oxidation of  produces
- (a)  (b)  (c)  (d) 
27. The treatment of  $\text{H}_2\text{C}=\text{CHCH}_2\text{CH}_2\text{OH}$  with conc.  $\text{HCl}$  results into the formation of
- (a)  $\text{H}_2\text{C}=\text{CHCH}_2\text{CH}_2\text{Cl}$  (b)   
 (c)  $\text{H}_3\text{CCH}(\text{Cl})\text{CH}=\text{CH}_2$  (d)  $\text{H}_3\text{CCH}=\text{CHCH}_2\text{Cl}$
28. Which of the following alcohols show the iodoform test?  
 (a)  $\text{CH}_3\text{OH}$  (b)  $\text{CH}_3\text{CH}_2\text{OH}$  (c)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$  (d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

### Linked Comprehension Type

1. Given are the two reactions



- (i) The reactions (I) and (II), respectively, proceed via

- (a)  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}1$  mechanisms (b)  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$  mechanisms  
 (c)  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}1$  mechanisms (d)  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}2$  mechanisms

- (ii) The products P and Q, respectively, are

- (a)  $(\text{CH}_3)_3\text{C}-\underset{\text{CH}_3}{\text{CH}}-\text{Cl}$  and  $(\text{CH}_3)_3\text{C}-\text{CH}_2-\text{Cl}$  (b)  $(\text{CH}_3)_2\text{C}-\underset{\text{Cl}}{\text{CH}}(\text{CH}_3)_2$  and  $(\text{CH}_3)_3\text{C}-\text{CH}_2-\text{Cl}$   
 (c)  $(\text{CH}_3)_2\text{C}-\underset{\text{Cl}}{\text{CH}}(\text{CH}_3)_2$  and  $(\text{CH}_3)_2\text{C}-\underset{\text{Cl}}{\text{CH}}_2\text{CH}_3$  (d)  $(\text{CH}_3)_2\text{C}-\underset{\text{CH}_3}{\text{CH}}-\text{Cl}$  and  $(\text{CH}_3)_2\text{C}-\underset{\text{Cl}}{\text{CH}}_2\text{CH}_3$

- (iii) The reactions I and II, respectively, follow

- (a) first-order and first-order kinetics (b) first-order and second-order kinetics  
 (c) second-order and first-order kinetics (d) second-order and second-order kinetics

2. Given are the two reactions



- (i) The reactions I and II, respectively, proceed via

- (a)  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}1$  mechanisms (b)  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$  mechanisms  
 (c)  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}1$  mechanisms (d)  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}2$  mechanisms



(ii) The reactions I and II, respectively, follow

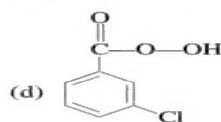
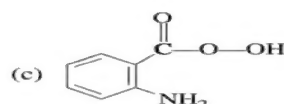
- (a) first-order and first-order rate laws  
(b) first-order and second-order rate laws  
(c) second-order and first-order rate laws  
(d) second-order and second-order rate laws

(iii) In both the reactions, the reactants react to give an intermediate, respectively, via

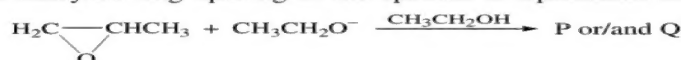
- (a) reversible and irreversible steps  
(b) reversible and reversible steps  
(c) irreversible and reversible steps  
(d) irreversible and irreversible steps

3. Oxiranes are synthesized by treating an alkene with an organic peroxy acid. This process is known as epoxidation. The highly strained three-membered ring in epoxide makes it much more reactive towards nucleophilic substitution than other ethers.

(i) The most commonly used peroxy acid is



(ii) The base-catalyzed ring opening of the epoxide is represented as follows.



where P is  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}(\text{OH})\text{CH}_3$  and Q is  $\text{CH}_3\text{CH}(\text{OCH}_2\text{CH}_3)\text{CH}_2\text{OH}$

Which of the following product(s) is/are obtained?

- (a) P only  
(b) Q only  
(c) Equal mixture of P and Q  
(d) Unequal mixture of P and Q

(iii) The acid-catalyzed ring opening of the epoxide is represented as follows.



where P is  $\text{CH}_3\text{OCH}_2\text{CH}(\text{OH})\text{CH}_3$  and Q is  $\text{CH}_3\text{CH}(\text{OCH}_3)\text{CH}_2\text{OH}$

Which of the following product(s) is/are obtained?

- (a) P only  
(b) Q only  
(c) Equal mixture of P and Q  
(d) Unequal mixture of P and Q

4. Oxiranes are synthesized by treating an alkene with an organic peroxy acid. This process is known as epoxidation. The highly strained three-membered ring in epoxide makes it much more reactive towards nucleophilic substitution than other ethers.

(i) In the reaction



where P is (cis-2,3-dimethyloxirane) and Q is The product(s) obtained

is/are

- (a) P only  
(b) Q only  
(c) Equal mixture of P and Q  
(d) Unequal mixture of P and Q

(ii) The reaction of  $\text{C}_6\text{H}_5\text{MgBr}$  with the oxirane  $\text{H}_2\text{C}-\text{CHCH}_3$  may be represented as



where P is  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$  and Q is  $\text{CH}_3\text{CH}(\text{C}_6\text{H}_5)\text{CH}_2\text{OH}$

Which of the following product(s) is/are obtained?

- (a) P only  
(b) Q only  
(c) Equal mixture of P and Q  
(d) Unequal mixture of P and Q

(iii) The acid-catalyzed hydrolysis of an epoxide gives

- (a) an alcohol  
(b) a glycol  
(c) an aldehyde  
(d) a ketone

### Assertion and Reason Type

Given below are a few questions containing two statements. Based on the following key, answer correctly each question.

- (a) Both statements are correct and Statement-2 is correct explanation of Statement-1.  
(b) Both statements are correct and Statement-2 is not correct explanation of Statement-1.  
(c) Statement-1 is correct and Statement-2 is incorrect.  
(d) Statement-1 is incorrect and Statement-2 is correct.

#### Statement-1

- Solubility of *n*-alcohol in water decreases with increase in its relative molar mass.
- Cyclopentylmethylcarbinol does not give iodoform test.
- 1,4-Hexadien-3-ol is converted into a mixture of 3,5-hexadien-2-ol and 2,4-hexadien-1-ol when dissolved in  $\text{H}_2\text{SO}_4$ .
- RSH is a weaker acid than ROH.
- $\text{RS}^-$  attracts  $\text{H}^+$  less strongly than  $\text{RO}^-$ .
- Thiols have lower boiling point than the corresponding alcohols.
- Acid catalysed dehydration of *tert*-butanol proceeds faster than that of *n*-butanol.

#### Statement-2

The relative proportion of the hydrocarbon part in alcohols increases with increasing molar mass which permits enhanced hydrogen bonding with water.  
An alcohol containing a methyl carbinol with at least one H atom on the carbinol C gives iodoform test.  
 $\text{H}_2\text{SO}_4$  helps removing OH as  $\text{H}_2\text{O}$  generating a carbocation which involves rearrangement to yield conjugated diene. The addition of  $-\text{OH}$  gives desired results.  
O is more electronegative than S.  
The  $-\text{ve}$  charge on S in  $\text{RS}^-$  is more spread out than the  $-\text{ve}$  charge on O in  $\text{RO}^-$ .  
Thiols are less polar and form weaker intermolecular H-bonds.  
The acid catalysed dehydration of an alcohol proceeds via the formation of a carbocation.

## ANSWERS

### Straight Objective Type

- |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (a)  | 2. (a)  | 3. (b)  | 4. (d)  | 5. (b)  | 6. (a)  | 7. (a)  |
| 8. (b)  | 9. (c)  | 10. (a) | 11. (c) | 12. (a) | 13. (a) | 14. (d) |
| 15. (d) | 16. (a) | 17. (d) | 18. (a) | 19. (b) | 20. (d) | 21. (a) |
| 22. (a) | 23. (b) | 24. (c) | 25. (b) | 26. (b) | 27. (a) | 28. (c) |
| 29. (b) | 30. (c) | 31. (b) | 32. (b) | 33. (a) | 34. (c) | 35. (b) |
| 36. (a) | 37. (c) | 38. (b) | 39. (a) | 40. (b) | 41. (b) | 42. (d) |

- |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| 43. (a) | 44. (b) | 45. (c) | 46. (d) | 47. (a) | 48. (b) | 49. (b) |
| 50. (d) | 51. (c) | 52. (a) | 53. (a) | 54. (d) | 55. (b) | 56. (c) |
| 57. (d) | 58. (a) | 59. (c) | 60. (c) | 61. (c) | 62. (d) | 63. (c) |
| 64. (c) | 65. (b) | 66. (a) | 67. (a) | 68. (a) | 69. (a) | 70. (a) |
| 71. (b) | 72. (b) | 73. (a) | 74. (a) | 75. (b) |         |         |

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**Multiple Correct Choice Type**

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- |                        |                        |                        |                        |                   |
|------------------------|------------------------|------------------------|------------------------|-------------------|
| 1. (b), (c)            | 2. (b), (c), (d)       | 3. (a), (b), (c), (d)  | 4. (b), (d)            | 5. (a), (b), (d)  |
| 6. (b), (c)            | 7. (a), (b), (c), (d)  | 8. (a), (d)            | 9. (a), (c)            | 10. (a), (c), (d) |
| 11. (c), (d)           | 12. (a), (b)           | 13. (a), (b), (c), (d) | 14. (c), (d)           | 15. (a), (c)      |
| 16. (a), (b), (c)      | 17. (b), (c)           | 18. (a), (b), (d)      | 19. (c), (d)           | 20. (a), (d)      |
| 21. (a), (b), (c), (d) | 22. (a), (b)           | 23. (c), (d)           | 24. (a), (b), (c), (d) | 25. (a), (c)      |
| 26. (b), (d)           | 27. (a), (b), (c), (d) | 28. (b), (c)           |                        |                   |

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**Linked Comprehension Type**

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- |            |          |           |            |          |           |
|------------|----------|-----------|------------|----------|-----------|
| 1. (i) (b) | (ii) (c) | (iii) (d) | 2. (i) (c) | (ii) (d) | (iii) (b) |
| 3. (i) (d) | (ii) (a) | (iii) (b) | 4. (i) (a) | (ii) (a) | (iii) (b) |

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**Assertion Reason Type**

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- |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|
| 1. (c) | 2. (d) | 3. (a) | 4. (d) | 5. (a) | 6. (a) | 7. (b) |
|--------|--------|--------|--------|--------|--------|--------|

















